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Abstract

TECHNIQUE FOR VORTEX TYPE FLOW WITH PHASE SHIFT IN WATER REACTORS

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This report is based on work which has been carried out for the most part under a contract with the EURATOM-U.S.A. Joint Committee.

In the first place it has been shown that the longitudinal vortices which are contiguous and coherent can be produced and preserved in channels having different cross-sections, in particular those occuring in boiling water nuclear reactors where the fuel elements are placed at the nodes of a square lattice. Each elementary rootex is produced by a twisted metallic strip placed in the channel involved.

The pressure drop and the proportion of empty space during two-phased flow have been determined as a function of the main parameters which can apparently by regrouped in the form proposed by Martinelli and his co-workers.

By means of these twisted strips it has been possible to increase the heat applied to a boiling water current by 25 to 40 per cent for the same pumping power, depending on whether on operates at 70 bars or at atmospheric pressure. A part from their role of flow grids these strips joined together can become part of the core structure.

The calculation of K_∞ for a typical boiling water reactor fitted with spiral shows that the extra enrichment required to compensate for the presence of the absorbant material of the strip is very small (below 0.1 p. 100 for Zircalloy strips 0.4 mm thick).

A boiling reactor core designed to make best use of the spiral strips could operate at a volume power greater (by at least 50%) than that of a reactor without these spirals.

An economic study will show the advantageous conditions of use for this type of modification.

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